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most highly educated of the women. One hundred and seventy-five families give an average of 3.2 children to each. Of the few really large families, the evidence shows the mothers to have been in most cases well educated, and in a few cases exceptionally so. Dr. Hall's own experience has been, that young women in college are unusually healthy, and become increasingly so as the course progresses. She quotes President Bascom, of the University of Wisconsin, as saying, "The young women do not seem to deteriorate with us in health, but quite the opposite. . . . It has long seemed to me plain that a young woman who withdraws herself from society and gives herself judiciously to a college course is far better circumstanced in reference to health than the great majority of her sex."

*GENERAL PSYCHOLOGY, ITS DEFINITION,
LIMITS, AND METHOD.*¹

I.

It is necessary at the commencement of this treatise, not to define, — for that is almost impossible, — but to explain, the meaning of the term 'general psychology.' In fact, until now the term has been very rarely used; and in all scientific literature there is no work, so far as our knowledge extends, that bears this title.

Psychology, as ordinarily understood, is the science of intelligence: thus all depends upon the extension given to the word 'intelligence.' Taken etymologically only, intelligence signifies the comprehension of things, or the knowledge of the causes of action; but taken thus, the term is too narrow, for it follows that there is no intelligence save in connection with a self-conscious being. An unconscious intelligence would be, viewed etymologically, a meaningless phrase, since to comprehend a thing would imply, by definition, the consciousness of the comprehension. But the instances of unconscious intelligence, absurd though the expression is, are certainly many and convincing. Take, for example, the ordinary occurrence of the solution of a problem during sleep, though he who solves the problem is in total ignorance of it. Can it be denied that an intellectual process is here involved? We must, then, admit that there are intellectual phenomena which are unconscious or nearly so; and therefore psychology cannot be limited to the study of self-conscious intelligences. The chief difficulty here is in the language, since no other term except the inaccurate one, 'intelligence,' can be ap-

plied to this unconscious mental activity. The expression 'psychical activity' is indeed better, though somewhat pedantic. Perhaps it would be more fitting to use the word 'ideation,' leaving to the term 'intelligence' its precise, clear, and evident meaning; namely, the conscious comprehension of things. I, for my part, prefer to give the term 'psychology' an application wider even than unconscious ideation and conscious intelligence: for there are numerous beings which perform complicated acts that are called instinctive, in which no intelligence, whether conscious or unconscious, is involved. Can it be said that psychology takes no notice of instinct? Surely its exclusion would be permitted by no one. Instinct is a psychic force, intelligent as to the end in view, if not as to the means employed. This is sufficient to give it a place in general psychology.

Even if the act performed is not understood by the agent, it is nevertheless perfectly adapted to its end. Thus a vague and latent intelligence, of which we cannot deny the existence, is manifested. Moreover, we can trace all the gradations, in a clearly defined hierarchy, from blind instinct to wholly conscious intelligence. There are, then, diverse psychic forces, — instinct or latent intelligence; ideation or unconscious intelligence; and, finally, intelligence properly so called, that is, conscious intelligence.

But what are the sources of instinct? Whence does it arise? We do not fear to go on to such consequences as general psychology may point out. Just as the zoölogists and embryologists assign to beings, however diverse, the humble origin of a primary cell, so we may trace all psychic forces, instinctive and intelligent, to their humble origin in an elementary reflex action. Instinct is not always so complicated, as it is usual to suppose, when the term is employed without qualification. Unquestionably the instinct of the mother who bends lovingly over the cradle of her child, that of the bee that builds its hexagonal cell, and that of the insect which poisons the body of its victim behind the second cephalic ring, constitute complex intellectual operations, of which the psychological character is undeniable. But how often is instinct more simple and rudimentary?

Let us take an instance which is of historic interest; for it was by this example that Descartes first gave us, with remarkable precision, the theory of reflex action. Here is a heated object: if the hand touch it, it is immediately withdrawn. Is this instinct, is it reflex action, or is it an act of intelligence? Here is an act which at the same time combines the characteristics of all three classes of phenomena. It is an act of intelligence,

¹ Translated for this journal from the author's forthcoming work, entitled '*Essai de psychologie générale*.'

because consciousness, and consequently will, are involved; it is instinctive, because it is an instinct necessary to the preservation of life, and common to all beings, to avoid a contact which gives rise to pain; finally, it is reflex, for it is not determined by the will, and the withdrawal of the hand is effected before the resolve to withdraw it is made. Here, then, is an elementary reflex act which is at the same time intelligent and instinctive. Among the lower animals many instinctive movements are nothing but reflex actions. A limpet clings to its rock: it is but slightly fastened, and moves but slowly over the surface of the stone. But touch its shell, and attempt to lift it, and instantly it fastens itself firmly to the rock; and to detach it a very great expenditure of effort is necessary. Its firm adhesion to the stone has been instinctive, suddenly and resistlessly determined by contact with the aggressor. It is a reflex action, but instinct is also involved.

It is truly impossible to say just where instinct begins and reflex action ends. The two phenomena intermingle, and instinct should be regarded as a complicated reflex action.

'Intelligence,' 'instinct,' 'reflex action,' — these are the three terms of psychology. Between these three forms of activity there is no barrier, no hiatus, no abyss. The gradation is regular and without leap. And why should it not be so? Where in nature can sudden transitions, the existence of which was denied even by Aristotle, be found? Sudden appearances of a new phenomenon are not known. Between the man and the animal there is hardly any distinction. There is hardly any between the animal and the plant, and the beginnings of psychology are in the beginnings of life itself. It would be a useless task to attempt to limit psychology to the phenomena of instinct or of intelligence. Psychology commences with reflex action; so that its domain includes elementary reflex action, the movement by which the limpet clings closer to the rock, as well as the most complicated intellectual operation, for instance, the discussion of the Abelian functions. In what follows we shall see how, by successive steps, psychical action frees itself little by little from the elementary reflex phenomenon. Our aim has been to take the psychic phenomenon at its origin, however humble that may be, and to follow it in its progress through the uninterrupted series of living beings.

II.

It is this synthetic treatment that seems to us to merit the title of 'general psychology.'

The term is rarely used; but we believe that it deserves to take its place among the sciences. We

speak of general physiology, and the term is perfectly definite. The same should be true of general psychology. Chemistry is the science that treats of the molecular transformation of matter. According to the stand-point that is taken, we have a chemistry without any particular designation, treating of all the divisions of chemistry, or we have mineral chemistry, organic chemistry, physiological chemistry, industrial chemistry, analytical chemistry. But there is also a general chemistry, which passes over in silence both the particular facts, the details of which are without number, as well as their applications and the technique built upon them, while only the general laws of chemistry are discussed. The special subject of general chemistry is the totality of the molecular transformations of matter, — the theory of atoms, their affinities and classifications, the equivalence of forces, and so forth. Physiology, or the science of life, can also be studied from diverse points of view. We have physiology without any particular designation, which comprehends all the subdivisions of the science; human physiology, which studies specially the vital phenomena of man and the higher animals; comparative physiology, which treats of the vital functions of all animals in comparing the life of all beings from the lowest of animal forms to man, which is the highest development; vegetable physiology, which treats of the vital functions of plants; pathological physiology, which has to do with the functions of life as modified by disease; and, finally, general physiology, of which life in general forms the subject-matter. Details are passed over in silence, for they are due to special conditions which are almost invariably peculiar to some group of animals or other.

Such is the *raison d'être* of general physiology. It is the synthesis of all physiology, but of physiology apart from the myriad of details which encumber it, and set forth only in its main outlines and in its most general laws. While the classic works of physiology develop the complexity, which is almost infinite, of the vital function, general physiology presents us the picture of the grand unity of life as it is manifested, under forms so extremely diverse, on the surface of the earth.

Psychology, like physiology, falls into several very distinct divisions. There is a psychology without designation, which treats of psychology in its entirety and under all its phases; also a human psychology, limited to the study of the intelligence of man; also a comparative psychology, by which are analyzed the phenomena of intelligence exhibited by animals and allied to those manifested by man himself; a pathological

psychology, which describes and explains the modifications of the human intelligence caused by disease; and, finally, a general psychology, which, without taking up all the details of its subject-matter with their analyses and comparisons, strives to bring to a focus the facts of which the details are numberless. In a word, general psychology attempts to form a synthesis, profiting by the analyses made by human and comparative psychology.

For general psychology, as for general physiology, but one method is possible, — the experimental. And as to this, a short explanation is essential, in order that a confusion too frequently made may be avoided. As a matter of fact, an opinion, very easy of refutation, is frequently attributed to the defenders of experimental psychology. They are said to admit nothing but experience, and to deny the validity of introspection or the internal sense. But, on the contrary, no physiologist has ever thought of setting aside the subjective observation of the elements of knowledge. How can we study the effects of memory or of imagination, unless we observe ourselves? Who is the physiologist or naturalist that upholds this opinion? and why combat it, when no one defends it? Internal observation gives us a psychology based on experience which is quite as legitimate and quite as fruitful as the most thoroughly experimental physiology can be imagined to be. The facts gained from the study of the *ego* are quite as valuable, provided they have been observed carefully and methodically, as the physiological phenomena recorded in the laboratories by the most perfect methods that our modern technique has devised.

But, however important this internal observation may be when it addresses itself to consciousness, it can be applied to but a single object, the knowledge of the *ego*. Beyond this it is dangerous and sterile. In is not internal observation which tells us how the stars move, and what the properties of matter may be. It knows and studies the *ego*. It observes itself, it judges itself, but it is forbidden to leave this domain of the *ego*, — a domain so vast that numberless discoveries are yet to be made in it, and yet so narrow that the *ego's* unsatisfied curiosity urges it eagerly beyond it. But here science alone, with its rigorous methods, its accurate apparatus, and its exact measurements, can make a progress which is slow but sure. In a word, introspection can only hope to know the facts of consciousness. The general properties of organic matter, whether it be inert or endowed with thought, remain for it unknown. They fall within the province of physics, chem-

istry, and physiology. Introspection can only judge phenomena.

But this is common to all the sciences. Nevertheless it applies particularly to psychology, which proceeds by introspection carried on with great care. For psychology cannot experiment: it can only observe. And it is well known that sciences founded upon observation are not so rich as are sciences of experiment, in conclusions of various and far-reaching import. Under all circumstances we are forbidden to ratiocinate, that is to say, to construct systems of metaphysics and of transcendental physics. That which psychology can do, and which it alone can do, is to observe the phenomena of consciousness. Beyond that, it is but an illusion.

Thus general psychology, aided now by introspection, now by the study of organic beings, now by experiment, extends from the lowest animal all the way up to man. But is this its whole sphere? For our part, we do not hesitate to say yes; for, if there should exist in nature intelligences or conscious powers analogous to those of man, they have not yet been revealed to us. Assuredly it would be absurd to suppose that this earth alone, among all the infinity of worlds, is the only portion of space where intelligent beings exist. The very fact that men exist on the earth renders it extremely probable that life has appeared on other stars also, and that there exist there intelligences similar to ours. The chemical composition of the stars is almost the same as that of our planet, and consequently the same phenomena ought to be manifest there as here. But our feeble science cannot go so far. We are limited to a terrestrial psychology, which is probably the only one of which man can ever know any thing. Though thus restricted to the animal world and to the consciousness of the *ego*, general psychology, presenting facts in their totality and not in detail, is not only a science of immense scope, but the most attractive of all the departments of human knowledge.

CHARLES RICHET.

GEOGRAPHICAL NOTES.

Europe.

Some more detailed news of the Riviera earthquake of Feb. 23 has been received. The facts, so far as they are of scientific interest, are summed up by Father Denza of the Montcalieri observatory. He states that the shaken area extended to the east along a line leaving the plains of Lombardy at Lomellina, and passing by the district of Alessandria to the Riviera di Levante, and westward, over all the western Alps, proceeding to-